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**Junk et al.**

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(54) **HINGED BEAM RETAINER**

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***B62B 7/02*** (2006.01)

(52) **U.S. Cl.** ..... **280/47.315**; 417/234; 417/364; 417/539; 123/195 R; 280/47.24; 280/79.4; 280/79.5; 280/47.32; 280/652

(58) **Field of Classification Search** ..... 123/195 R; 280/47.24, 47.315, 79.4, 79.5, 48.32, 652, 280/655.1; 134/172; 417/234, 364, 539
See application file for complete search history.

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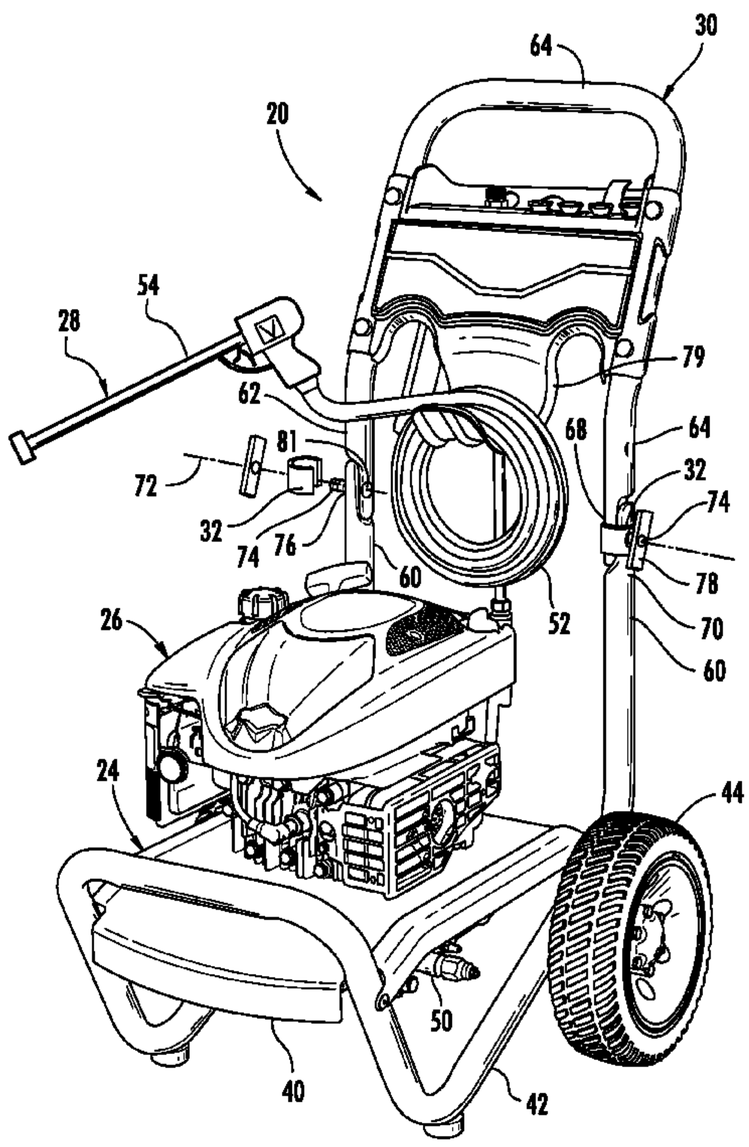
(57) **ABSTRACT**

A retainer extends across first and second overlapping hinged beams to retain the hinged beams against pivotal movement.

**23 Claims, 9 Drawing Sheets**



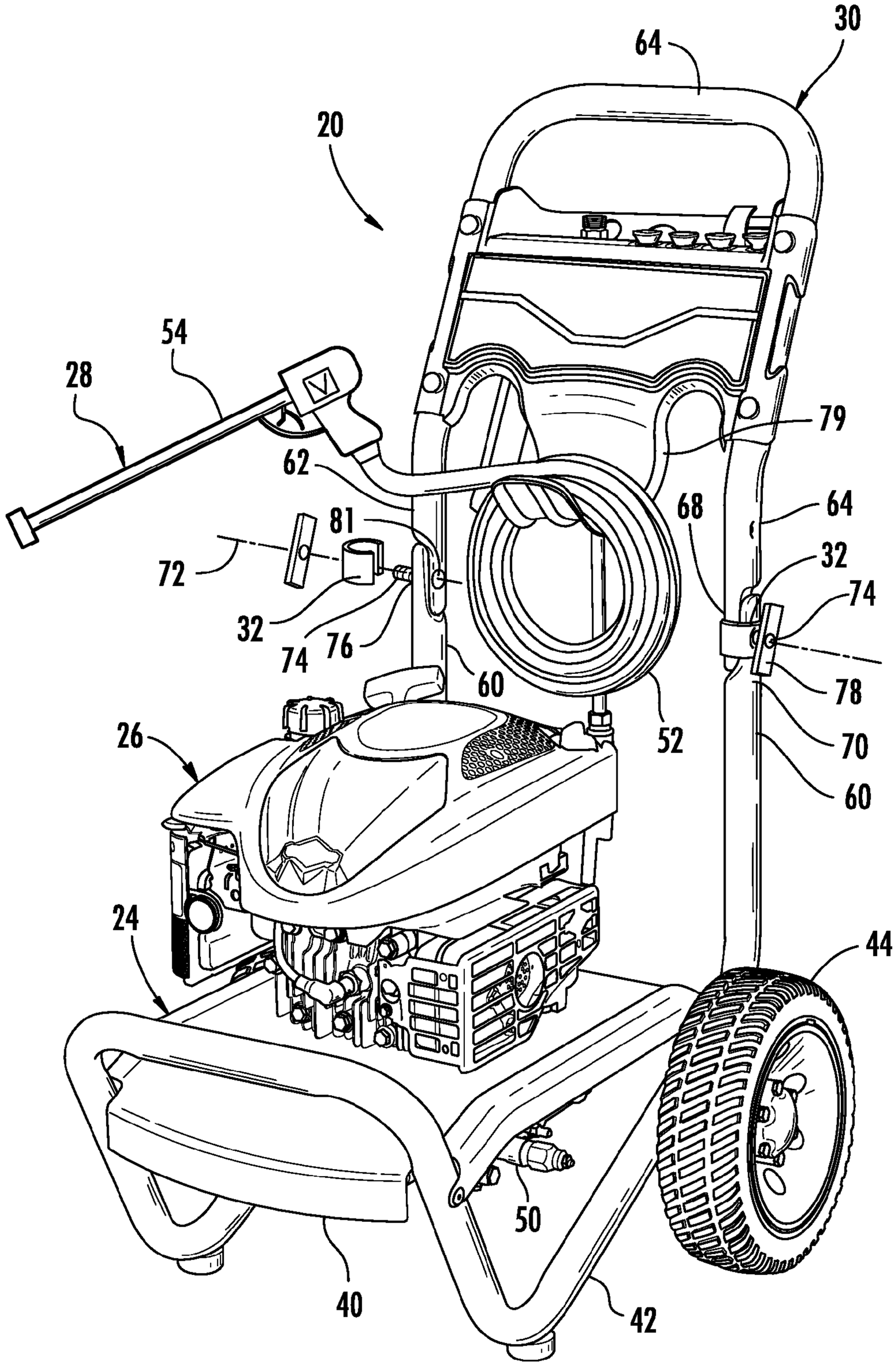

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FIG. 1

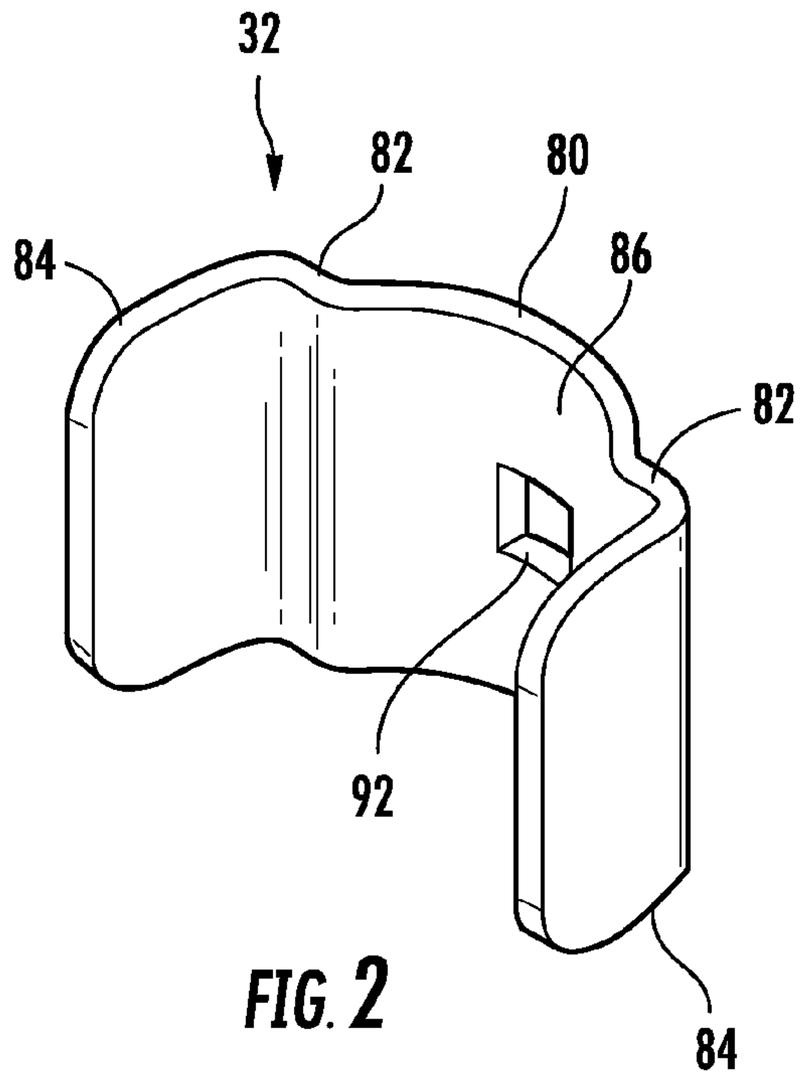


FIG. 2

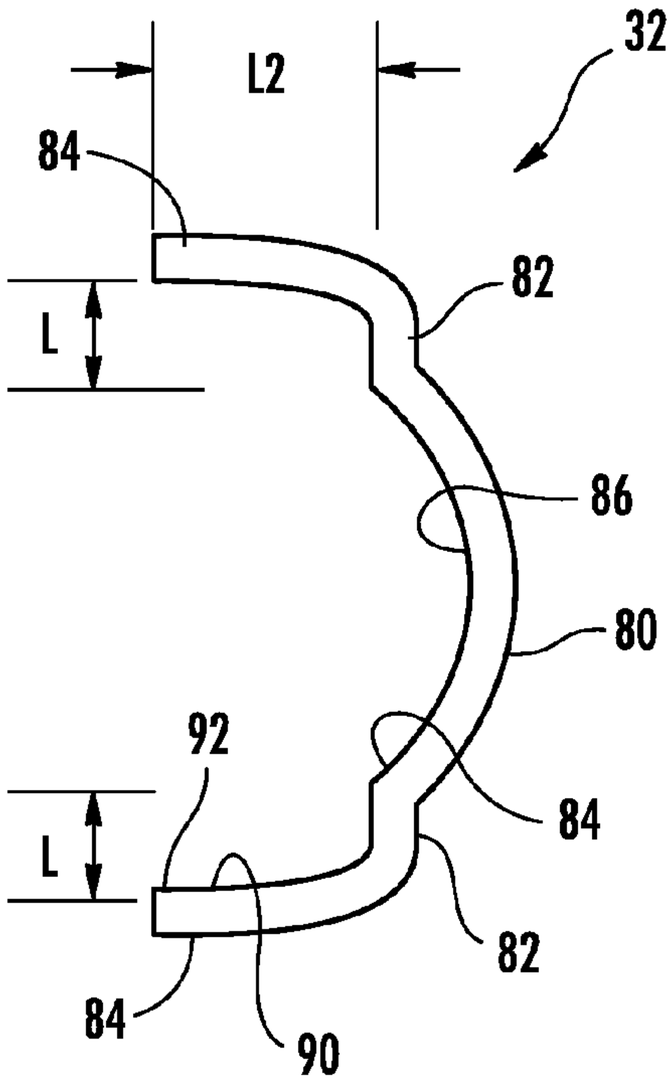


FIG. 3

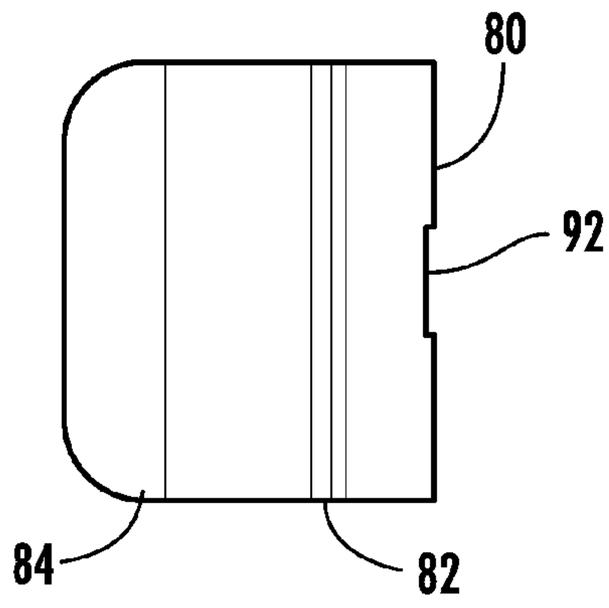


FIG. 4

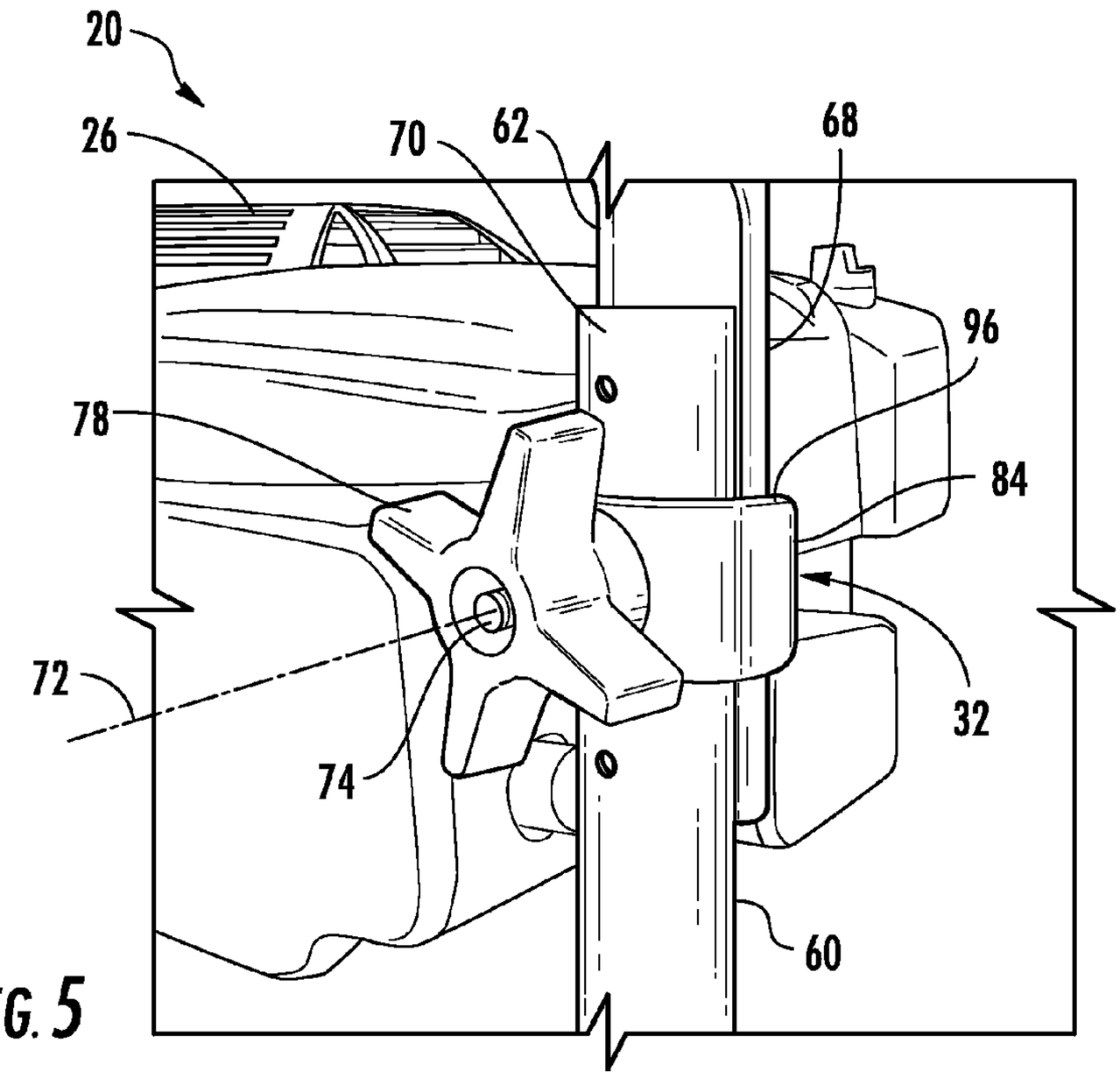


FIG. 5

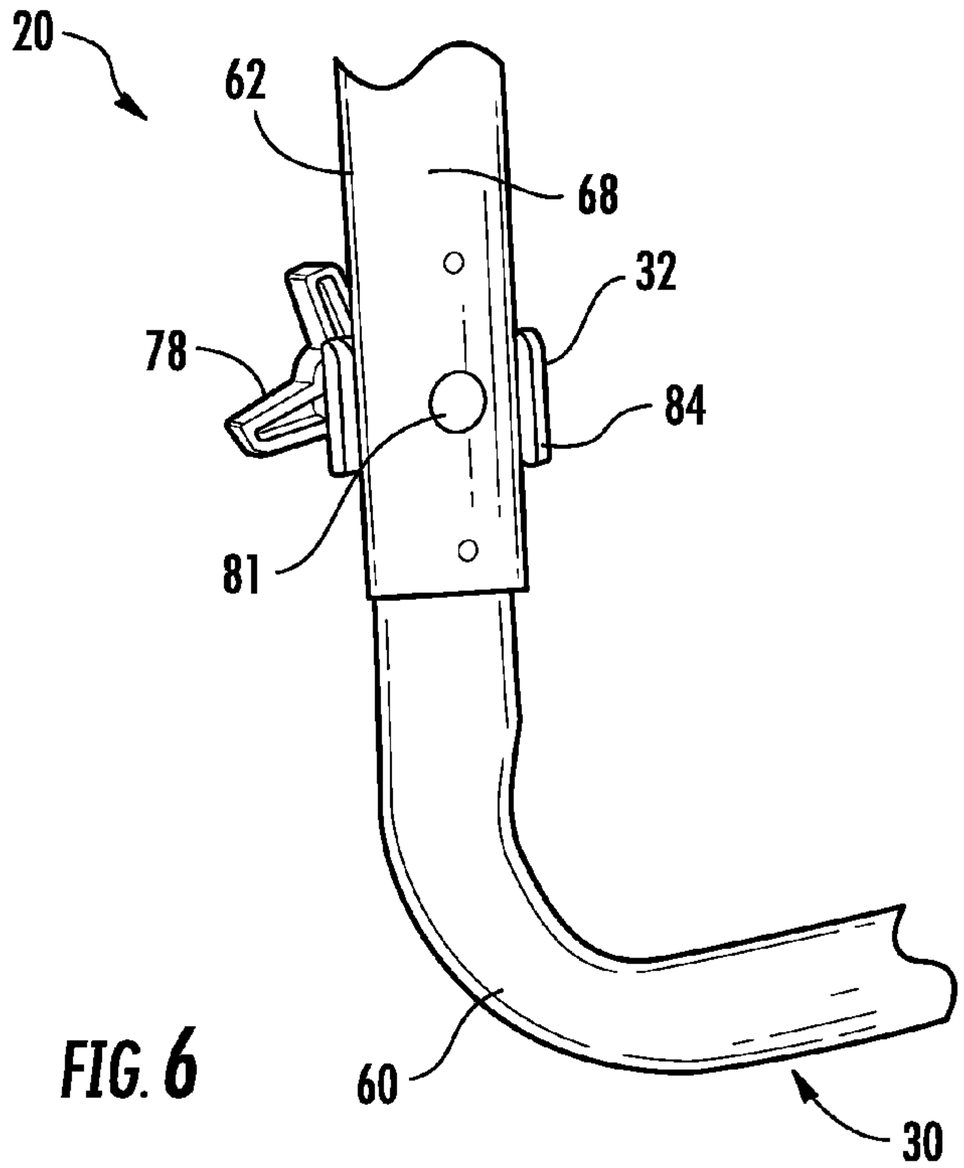


FIG. 6

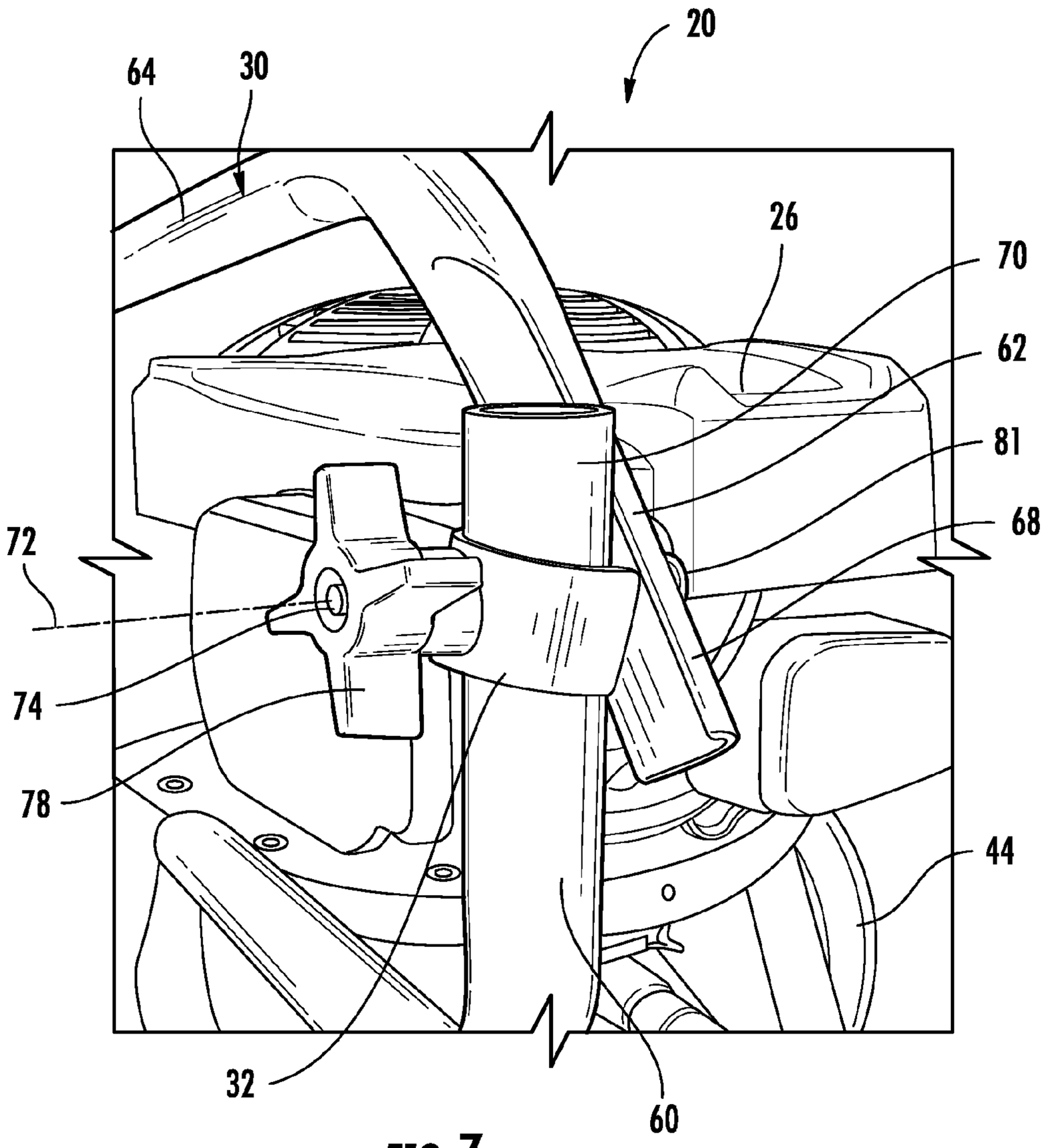


FIG. 7

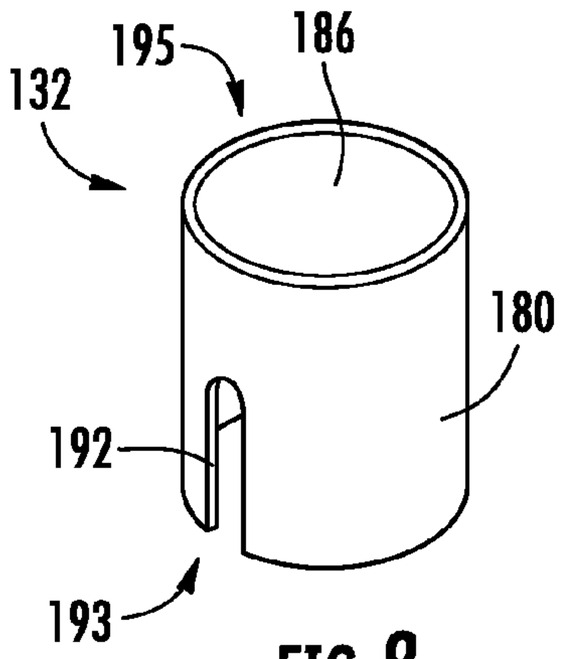


FIG. 8

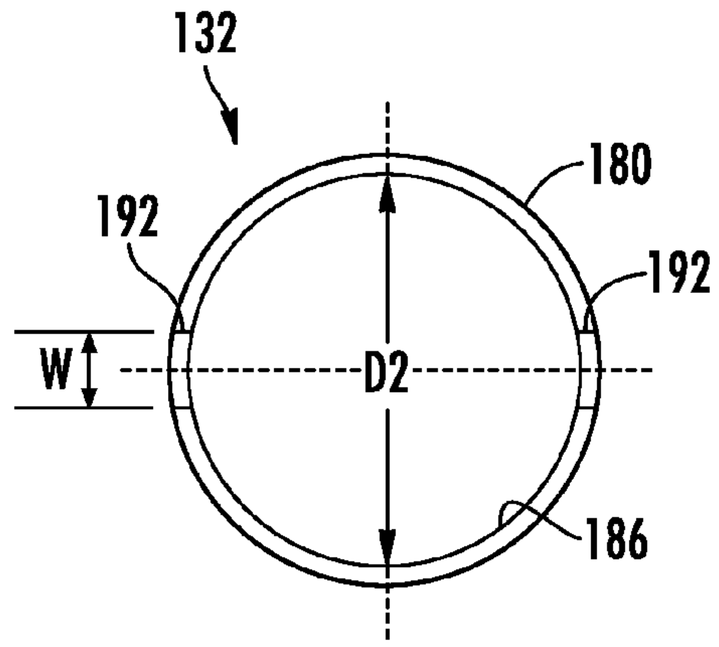


FIG. 9

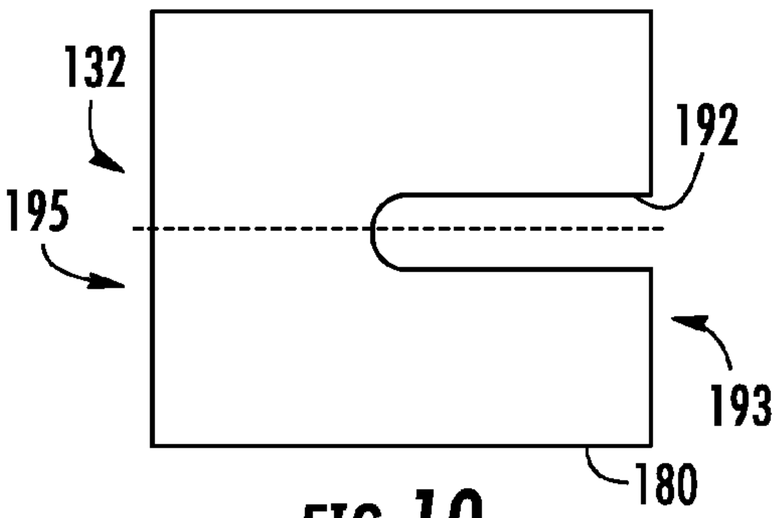


FIG. 10

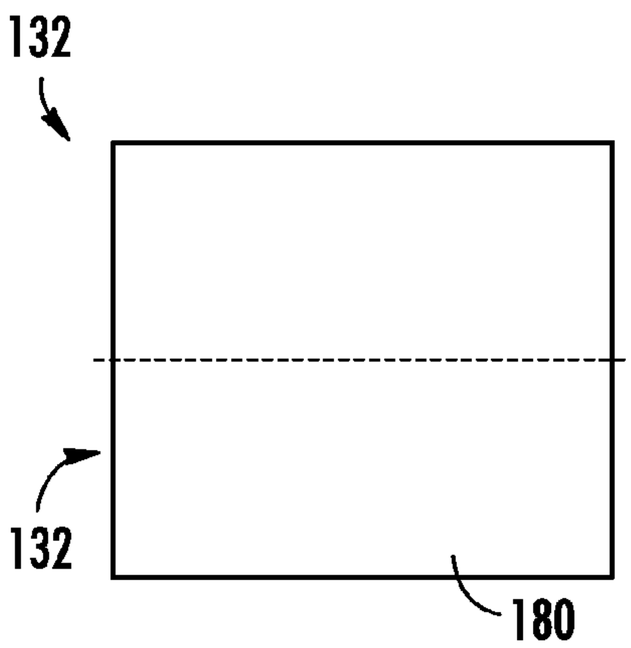


FIG. 11

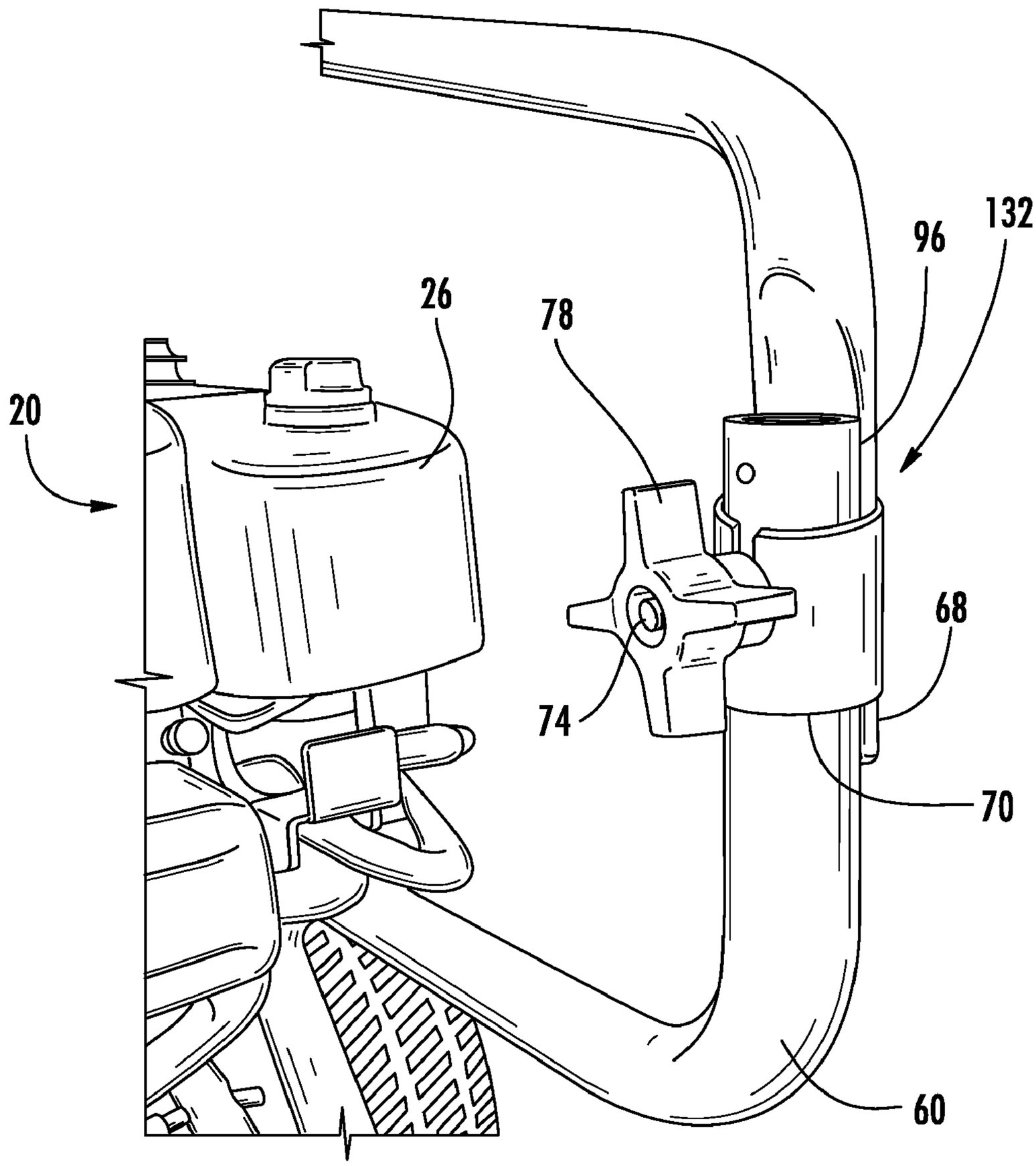


FIG. 12

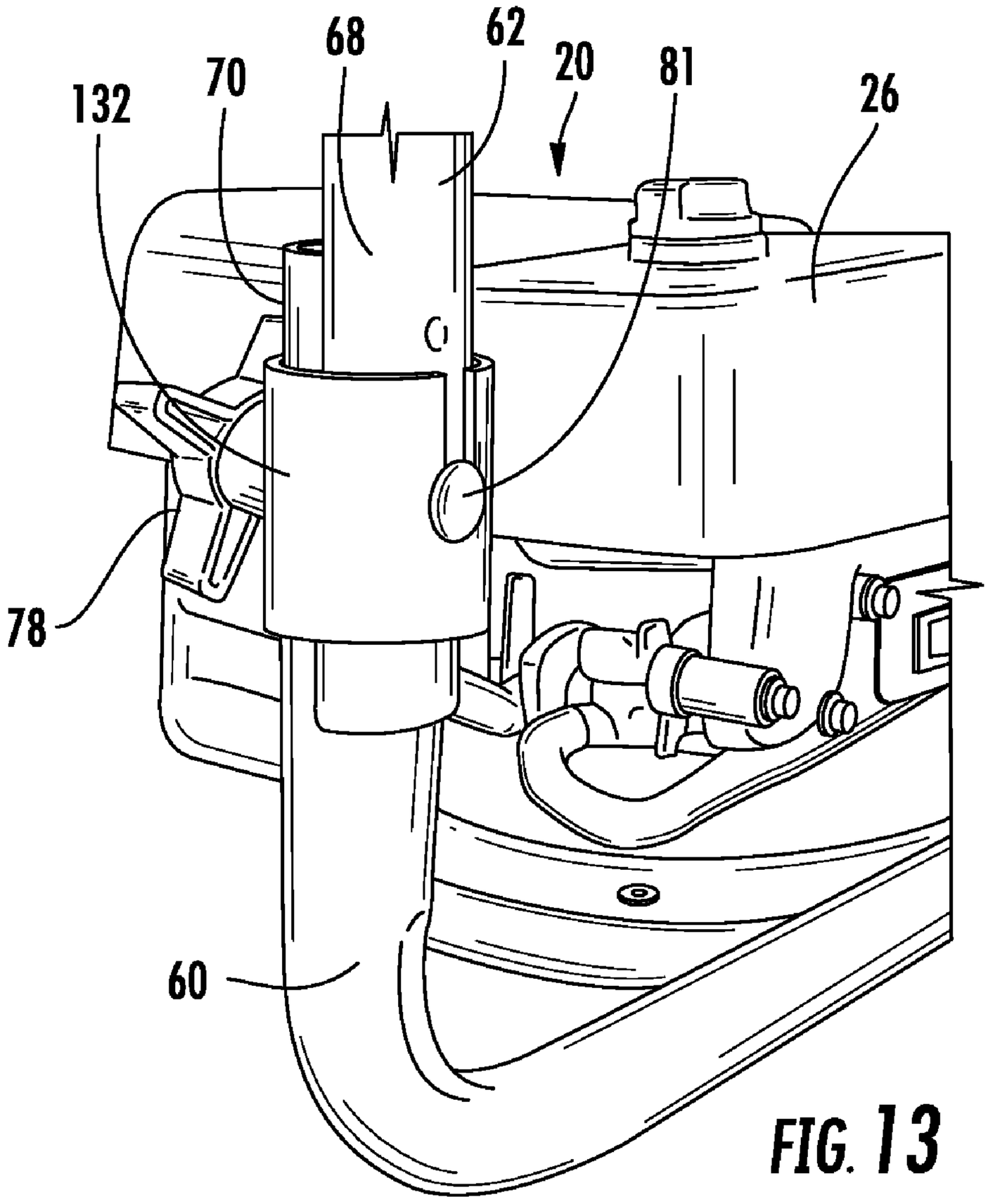


FIG. 13

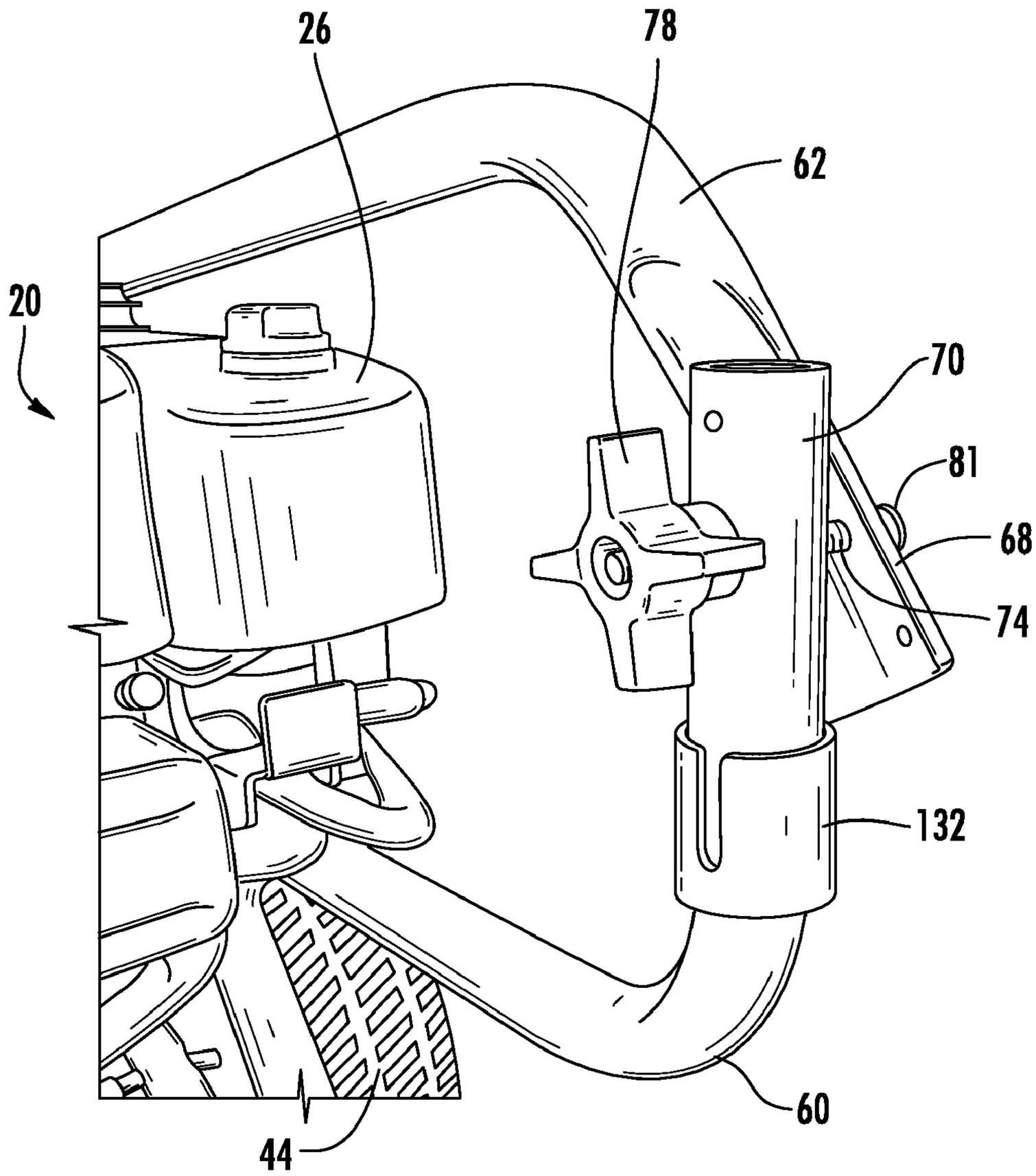


FIG. 14

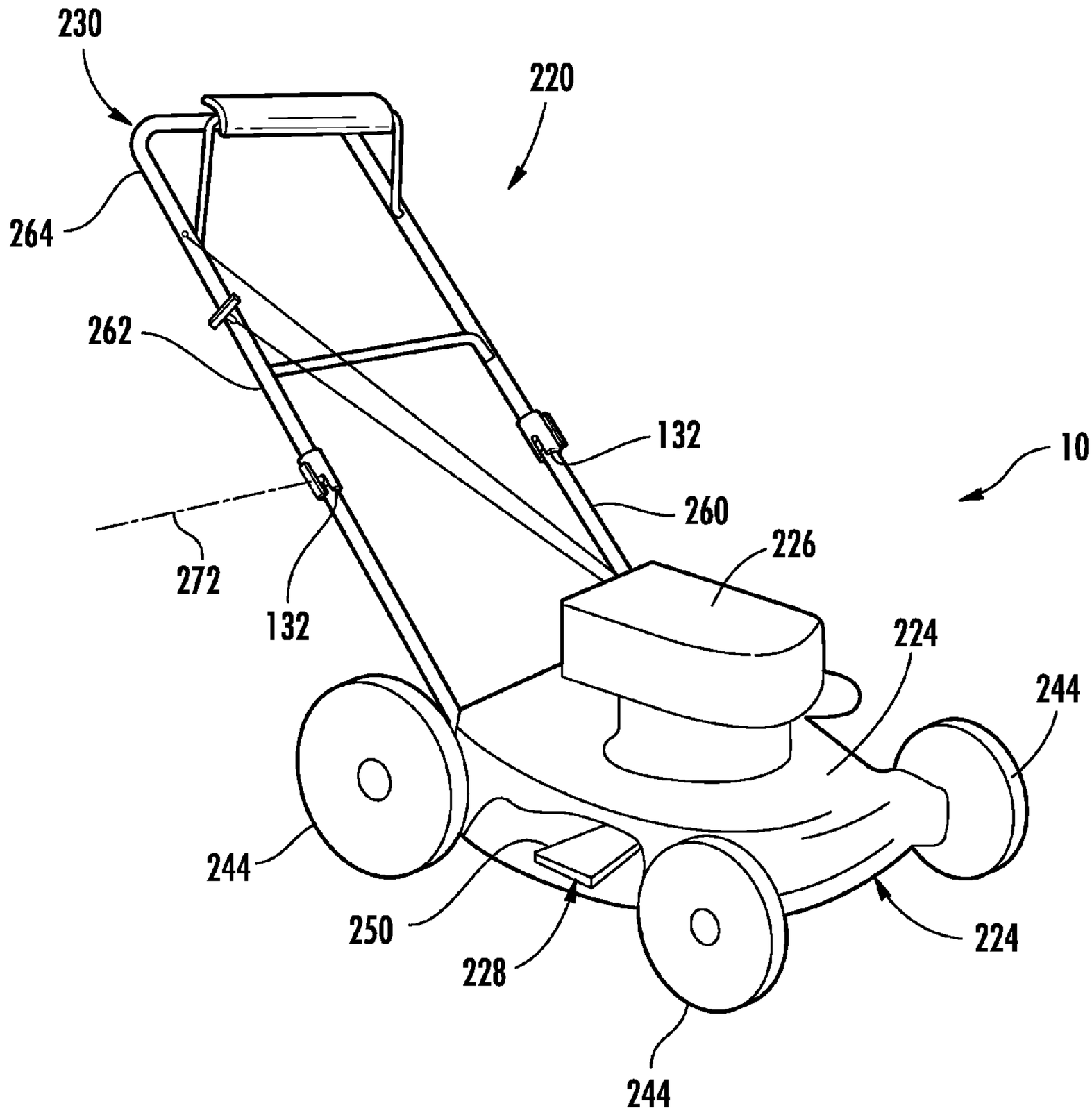
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FIG. 15

# HINGED BEAM RETAINER

## BACKGROUND

Appliances, such as pressure washers, lawnmowers and the like, sometimes include handles formed from multiple overlapping beams which are hinged to one another to allow the handles to be folded for transporting and storage. A bolt is used to tighten the beams against one another to inhibit pivoting of the beams during use.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a front perspective view of a foldable appliance having a handle maintained in an unfolded state by retainers according to an example embodiment.

FIG. **2** is a isometric view of one of the retainers of FIG. **1**.

FIG. **3** is a top plan view of the retainer of FIG. **2**.

FIG. **4** is a side view of the retainer of FIG. **2**.

FIG. **5** is a perspective view of the retainer of FIG. **2** on the appliance of FIG. **1** in a locked position.

FIG. **6** is another perspective view of the retainer of FIG. **2** on the appliance of FIG. **1** in a locked position.

FIG. **7** is a perspective view of the retainer of FIG. **2** in an unlocked position and the appliance in a folded state.

FIG. **8** is a isometric view of another embodiment of the retainer of FIG. **2**.

FIG. **9** is a top plan view of the retainer of FIG. **8**.

FIG. **10** is a side view of the retainer of FIG. **8**.

FIG. **11** is a front view of the retainer of FIG. **8**.

FIG. **12** is a perspective view of the retainer of FIG. **8** on the appliance of FIG. **1** in a locked position.

FIG. **13** is another perspective view of the retainer of FIG. **8** on the appliance of FIG. **1** in a locked position.

FIG. **14** is a perspective view of the retainer of FIG. **8** in an unlocked position on the appliance of FIG. **1** in a folded state.

FIG. **15** is a front perspective view of a foldable appliance (lawnmower) having a handle maintained in an unfolded state by the retainer of FIG. **8** according to an example embodiment.

## DETAILED DESCRIPTION OF THE EXAMPLE EMBODIMENTS

FIG. **1** illustrates a foldable appliance (shown as a fluid sprayer **20**) according to an example embodiment. Fluid sprayer **20** delivers fluid under relatively high pressures. As will be described hereafter, fluid sprayer **20** includes a foldable handle that comprises a pair of overlapping beams which are hinged to one another, allowing the handle of the fluid sprayer **20** to be folded for compactness during transporting and storage of the fluid sprayer **20**. As will be further described hereafter, fluid sprayer **20** includes retainers that extend across or overlap a junction of the overlapping beams. The retainers more reliably secure and maintain the overlapping beams and the handle against pivoting or folding movement during use of fluid sprayer **20**.

Fluid sprayer **20** includes support **24**, drive unit **26**, working unit **28**, handle **30** and retainers **32**. Support **24** comprises one or more structures configured to serve as a foundation for supporting the remaining components of the foldable appliance (fluid sprayer **20**). In the example illustrated, support **24** includes platform **40**, frame **42** and wheels **44**. Platform **40** comprises a base supporting drive unit **26** and working unit **28**. In other embodiments, platform **40** may comprise bracket, a frame or other structures.



Frame **42** comprises a series of beams, brackets or other structures extending between platform **40**, wheels **44** and handle **30**. In the example illustrated, frame **42** is integrally formed as part of a single unitary body with portions of handle **30**. In other embodiments, frame **42** may alternatively be formed as part of single unitary body with platform **40**. Although illustrated as being formed from a shaped tubular member, frame **42** may have other configurations.

Wheels **44** are rotationally coupled to frame **42** and assist in elevating portions of frame **42** and platform **40** above a supporting surface or ground. In the example illustrated, wheels **44** freely rotate or idle. In other embodiments, wheels **44** may be powered or driven by an engine or motor. Although fluid sprayer **20** is illustrated as including a pair of wheels **44** (one of which is shown), wherein a front end of frame **42** rests upon the ground or underlying surface, in other embodiments, fluid sprayer **20** may include three, four or additional wheels. In yet another embodiment, wheels **44** may be omitted or replaced with other ground motive mechanisms such as tracks, skis or the like. Although wheels **44** illustrated as being rotationally coupled to frame **42**, in other embodiments, wheels **44** may alternatively be operably coupled to platform **40** or to portions of drive unit **26** or working unit **28**.

Drive unit **26** comprises a unit or mechanism configured to provide or supply torque or other motive force to working unit **28**. In the example illustrated, drive unit **26** comprises an internal combustion engine operably coupled to working unit **28** and supported by support **24**. In other embodiments, drive unit **26** may alternatively comprise electrically powered motor. In the yet other embodiments, drive unit **26** may be omitted, such as where working unit **28** is manually powered.

Working unit **28** comprises one or more mechanisms configured to utilize the received torque or force to transform or work upon the surrounding environment or a medium. In the example illustrated, working unit **28** comprises fluid pump **50**, hose **52** and spray gun **54**. Fluid pump **50** is suspended below platform **40** and is configured to pressurize fluid, such as water. According to one embodiment, the pump serving as working unit **50** comprises a pump at least similar to the pump shown and described in U.S. Pat. No. 6,092,998 to Dexter et al. which issued on Jul. 25, 2000, the full disclosure of which is hereby incorporated by reference. Hose **52** is connected to fluid pump **50** and delivers pressurize fluid from fluid pump **52** spray gun **54**. Spray gun **54** allows a person to selectively control and direct the emission of pressurized fluid.

In other embodiments, working unit **28** may comprise mechanisms configured to perform other functions. For example, in other embodiments, working unit **28** may comprise transmission and cutting blades of a lawnmower, trimmer or other cutting mechanism, the transmission and auger of a snow thrower or snow blower, the transmission and tines or blades of a tiller, the electrical power generating components of an electrical generator or other working mechanisms.

Handle **30** extends from support **24** and is configured to be manually grasped by a person using appliance **20**, allowing the person to reposition and move appliance **20**. Handle **30** includes lower beams **60**, upper beams of **62** and cross member **64**. Lower beams **60** form a lower portion of handle **30** and extend upwardly from support **24** on opposite transverse sides of appliance **20**. In the example illustrated, lower beams **60** are integrally formed as part of a single unitary body with the tubular members of frame **42**. In other embodiments, lower beams **60** may alternatively be joined to frame **42** or to platform **40** directly or indirectly in other manners. In the example illustrated, lower beams **60** comprise tubular mem-

bers. In other embodiments, lower beams **60** may alternatively have other cross-sectional shapes. Lower beams **60** are coupled to upper beams **62**.

Upper beams **62** and cross member **64** form an upper portion of handle **30**. Upper beams **62** have lower portions **68** that overlap upper portions **70** of lower beams **60**. Upper beams **62** are hinged or pivotally coupled to lower beams **60** for pivotal movement about pivot axis **72**. In the example illustrated, upper beams **62** are hinged to lower beams **60** about axis **72** by shafts **74** extending along axis **72** through one or more apertures **76** formed in overlapping portions **68**, **70** of lower beams **60** and upper beams **62**, respectively, and also located across or aligned with axis **66**.

In the example illustrated, shafts **74** are provided by elongate bolts having a head **81** at one end and a threaded portion at another end, wherein a threaded nut **78** retains the bolt within and across the one of more apertures **76**. In the example illustrated, the nut **78** is configured as a handle, similar to a thumbscrew, facilitating manual rotation of the shaft without the use of tools. Head **81** and nut **78** may be tightened and loosened with respect to overlapping portions **68**, **72** inhibit pivoting of beams **60**, **62** about axis **72** or to allow a person to pivot and fold handle **30** to a folded state, respectively.

In other embodiments, lower beams **60** and upper beams **62** may be hinged to one another in other fashions. For example, in other embodiments, other structures may be utilized to provide shafts **74** and other structures may be used to retain shafts **74** within apertures **76**. In another embodiment, shaft **74** may include a transverse opening through which a cotter pin or other retainer may be used to retain shaft **74** through and across apertures **76**. In one embodiment, bolt head **81** may alternatively comprise a hexagonal bolt head. In yet another embodiment, any one of a variety of hinges may be utilized.

In the example illustrated, upper beams **62** comprise tubular structures (circular, oval, polygonal or other cross-sectional shapes). Lower portions **68** of upper beams **62** are crimped or collapsed so to have a concave outer side having a cavity for partially receiving portions **70** of lower beams **60**. In other embodiments, lower portions **68** of upper beams **62** may alternatively be molded or otherwise formed to have a concave outer side having a cavity for at least partially receiving portions **70** of lower beams **60**. In still other embodiments, this relationship may be reversed, wherein portions **70** of lower beams **60** are crimped or collapsed so to have a concave outer side having a cavity for partially receiving portions **68** of upper beams **62**. In other embodiments, upper portions **70** of lower beams **60** may alternatively be molded or otherwise formed to have a concave outer side having a cavity for at least partially receiving portions **68** of upper beams **62**. Because one of portions **68**, **70** or mains largely tubular, the rigidity and strength of handle **30** at the overlap of portions **68**, **70** is substantially maintained.

Cross member **64** comprises a member extending between and interconnecting upper beams **62**. Cross member **64** cooperates with upper beams **64** to form a U-shaped handle. In the example illustrated, cross member **64** comprises tubular member integrally formed as part of a single unitary body with both of upper beams **62**. In other embodiments, cross member **64** may comprise separate member fastened, welded or connected to upper beams **62**.

As further shown by FIG. **1**, handle **30** may additionally be used to support and carry additional structures such as the hose hook **79** shown. In yet other embodiments, handle **30** may be utilized to support controls for one or both of drive unit **26** or working unit **28**. Although handle **30** is illustrated as being substantially an inverted U, in other embodiments, handle **30** may have other configurations wherein handle **30** is configured to be folded from an extended use state (shown in FIG. **1**) to a collapsed or folded state.

Retainers **32** comprise mechanisms configured to inhibit pivoting or folding of the upper portion of handle **30** relative to the lower portion of handle **30**. In particular, retainers **32** inhibit pivoting of upper beams **62** relative to lower beams **60** about pivot axis **72**. Retainers **32** overlap a junction between portions **68** and **70** of beams **60** and **62** to inhibit such pivoting. As a result, even when the fit and frictional hold between overlapping portions **68** and **70** may loosen and lessen over time or as a result of vibrations encountered during the use of washer **20**, upper beams **62** and the upper portion of handle **30** are less likely to accidentally pivot or fold about axis **72**. Retainers **32** inhibit relative movement of beams **60**, **62** such that a user that arrived with a more stable feel as if beams **60** and **62** were single continuous beams rather than foldable beams.

FIGS. **2-4** illustrate one of retainers **32** in more detail. As shown by FIG. **2-4**, retainer **32** comprises a generally C-shaped, open sided clip having a central portion **80**, extensions **82** and a pair of opposite arms **84**. Central portion **80**, extensions **82** and arms **84** cooperate to form a concave side or cavity **84** configured and sized to receive one of overlapping portions **68**, **70**, to extend across a seam or junction between overlapping portions **68**, **70** and to at least partially overlap the other of portions **68**, **70**. As shown in FIG. **3**, central portion **80** includes an inner surface **86** having a cross-sectional profile that substantially matches an outer profile of one of overlapping portions **68**, **70**. In the example illustrated in which portions **70** of lower beams **60** have a substantially circular cross-sectional profile, surface **86** of central portion **80** is also provided with an arcuate, and substantially circular, shape. As a result, central portion **80** more closely mates, contacts and abuts against the opposite portion **70** of lower beams **60** to more securely retain beams **60** and **62** against relative movement. In other embodiments in which the outer cross-sectional profile of portions **70** (or portions **68**) has other configurations such as oval configurations or polygonal configurations, surface **86** may likewise be provided with a corresponding shape and dimensions.

Extensions **82** project from opposite sides of central portion **80** between central portion **80** and arms **84**. As shown by FIG. **3**, each of extensions **82** widens or increases the distance D separating arms **84** and the width of cavity **84**. Extensions **82** each have a length L sufficient to accommodate a thickness of overlapping portions **68** which partially receives portions **70**. In the example illustrated, length L of each of extensions **82** is sufficiently close to the thickness of each of overlapping portions **68** overlapped by arms **84** such that inner surfaces **90** of arms **84** contact and certainly engage opposite surfaces of portions **68**. As a result, arms **84** more stably secure and bear against portions **68** to better inhibit relative movement of beams **60**, **62**.

Arms **84** comprise flanges, wings, or other projections extending from extensions **82** in a direction substantially or generally perpendicular to extensions **82**. Arms **84** each have a length L2 of sufficient size to extend across and overlap the seam or junction between portions **68**, **70**. In the example illustrated in which each retainer **32** is largely stiff and rigid, being formed from **12** gauge steel, arms **84** to find a largely unchanging mouth **92** of retainer **32**. Mouth **92** receives both beams **60** and **62**, particularly portions **68** and **70**. Because arms **84** are largely inflexible, a more secure fit and retention of beams **60** and **62** are achieved.

In other embodiments, one or more sections of central portion **80**, extensions **82** or arms **84** may be resiliently flexible to some extent such that mouth **92**, at rest, may be smaller than portions **68**, **72** be received within cavity **84**. In such an embodiment, arms **84** may extend inwardly. In such an embodiment, arms **84** resilient flex outwardly during reception of portions **68**, **70** and resiliently return towards the at rest state to grip portions **68**, **70**.

As further shown by FIG. **2**, retainer **32** includes an aperture **92** extending through central portion **80**. Aperture **92** is located such that when retainer **32** receives portions **68**, **70**, after **90** to extend across and may be substantially aligned with pivot axis **72** and apertures **76**. Aperture **92** is sized to receive shaft **74** such that shaft **74** may extend through aperture **92**. As a result, retainer **32** utilizes the already existing or already utilized shaft **74** to further retain and secure retainer **32** in position and in place relative to portions **68** and **70**.

Although aperture **92** is illustrated as being square, aperture **92** may be circular or may have other shapes. In still other embodiments, other structures are mechanisms may be used to secure and retain retainer **32** in place. For example, in other embodiments, retainer **32** may be held in place merely using a friction or clamping force against portions **68**, **70**. In yet other embodiments, other hooks, pins, claws or structures may be used to hold or retain retainer **32** in place with respect to portions **68** and **70** of beams **62** and **60**, respectively.

FIGS. **5-7** illustrate use of retainer **32** in more detail. FIGS. **5** and **6** are enlarged views of portions of handle **30** illustrating handle **30** in an extended state in which retainer **32** secures beams **60** and **62** against pivoting or folding. As shown by FIGS. **5** and **6**, head **81** and nut **78** are tightened so as to compress and urge portions **68** and **70** against one another. Head **81** and nut **78**, when sufficiently tightened, urge and retain arms **84** across the seam or juncture **96** between portions **68** and **70**. As a result, when retainer **32** is in the locked state or position shown, portions **68** may not substantially pivot about axis **72** without first contacting surfaces **90** of arms **84**. Although portions **68** are illustrated as extending on an inside of portions **70** of lower beams **60**, in other embodiments, this relationship may be reversed. For example, in other embodiments, head **81** may alternatively be positioned adjacent to an exterior of portions **70**. Likewise, although central portion **80** is illustrated as being adjacent to nut **78**, in other embodiments, retainer **32** may be repositioned such that central portion **80** extends adjacent to head **81** on an opposite side of portions **68**, **70** as nut **78**.

FIG. **7** illustrates handle **30** in a folded or least partially folded state. FIG. **7** illustrates head **81** and nut **78**, sufficiently loosened or spaced apart, to allow retainer **32** to be moved along shaft away from portions **68**, **70** such that arms **84** are retracted or withdrawn from across the seam or juncture **96** between portions **68** and **70**. FIG. **7** further illustrate an upper handle **30**, upper beams **62** and their lower end portions **68**, pivoted about axis **72** to a collapsed or folded state. When retainer **32** is in this unlocked state or position, handle **30** may be folded for more compact transport and storage.

Note that retainer **32** may be shifted or actuated between its locked state shown in FIGS. **5** and **6** and its unlocked state shown in FIG. **7** without complete removal or separation of retainer **32** from handle **30**. Retainer **32** may be shifted or actuated between its locked state shown in FIGS. **5** and **6** and its unlocked state shown in FIG. **7** without disconnection of beams **60**, **62** or disconnection of shaft **74**, head **81** or nut **78** from one another. As a result, switching retainer **32** between the locked and unlocked states may be more easily performed without the risk of retainer **32**, shaft **74**, head **81** or nut **78** becoming misplaced.

FIGS. **8-11** illustrate retainer **132**, another embodiment of retainer **32**. As with retainer **32**, retainer **132** portions **68**, **70** of beams **60** and **62** to inhibit pivoting or folding of beams **60**, **62** relative to one another. Retainer **132** generally comprises a hollow open-ended cylinder or tube having walls **180** having an inner diameter D**2** sufficiently sized so as to receive and completely encircle both overlapping portions **68**, **70** of tubes **62**, **60**. In the example illustrated, diameter D**2** is sized only slightly larger than the combined diameter of the widest portion of portions **68**, **70** such that interior surfaces **186** contact portions **68**, **70** at at least a multitude of positions or contact point extending on substantially all sides of portions **68**, **70**. This tight fit between retainer **132** and portions **68**, **70** provides a more stable or solid interconnection between beams **60**, **62**. In other embodiments, a looser fit may be provided between retainer **132** and portions **68**, **70**.

In one embodiment, the cross-sectional shape of interior surface **186** corresponds to the cross-sectional shape of the exterior of either or both of beams **60**, **62**. As a result, retainer **32** may more easily slide or be repositioned along being beams **60** or beams **62** to an unlocked position as described below. In addition, a larger percentage of interior surface **186** contacts portions **68**, **70** when retainer **32** is in a locked position as described below, providing a tighter hold of beams **60**, **62**. Although the tube or sleeve serving as retainer **132** is illustrated as having a circular cross-section interior and a circular cross-section exterior, in other embodiments, the sleeve providing retainer **132** may have a differently shaped interior and a differently shaped exterior.

As further shown by FIGS. **8-10**, retainer **132** includes a pair of opposite aligned apertures **192**. Apertures **192** are located such that when retainer **132** receives portions **68**, **70**, apertures **192** extends across and may be substantially aligned with pivot axis **72** and apertures **76**. Apertures **192** are sized to receive shaft **174** such that shaft **174** may extend through apertures **192**. As a result, retainer **132** utilizes the already existing or already utilized shaft **74** to further retain and secure retainer **132** in position and in place relative to portions **68** and **70**.

Apertures **192** have a diameter or width W greater than a width of shaft **76**, less than at least one dimension of head **81** (shown in FIG. **1**) and less than at least one dimension of nut **78** (shown in FIG. **1**). As a result, either of apertures **192** may be positioned adjacent to either of head **81** and nut **78**. In other embodiments, apertures **192** may have different widths with one of aperture **192** being smaller than head **81** and the other of apertures **192** being smaller than nut **78**.

As shown by FIGS. **8** and **10**, apertures **192** comprise elongate slots extending from the first axial end **193** partially towards end to a second opposite axial end **195**. The slots providing apertures **192** enable retainer **132** to be axially-slid or moved relative to shaft **74** while shaft **74** extends through and pivotally joins beams **60**, **62**. As a result, as shown in FIGS. **12-14** described hereafter, retainer **132** may be slid between locked and unlocked states or positions without removal or disconnection of beams **60**, **62**, shaft **74**, nut **78** or head **81** from one another. In other embodiments, however, apertures **192** may alternatively comprise continuously bounded or partially bounded openings which inhibit sliding movement of retainer **132** relative to shaft **74**. In such an alternative embodiment, shaft **74** is removed to permit retainer **132** to be slid along tubes **60**, **62** between locked and unlocked states.

FIGS. **12-14** are enlarged views of retainer **132** used on sprayer **20** (fully shown in FIG. **1**) in place of retainer **32**. FIGS. **12** and **13** are enlarged views of portions of handle **30** illustrating handle **30** in an extended state in which retainer

132 secures beams 60 and 62 against pivoting or folding. As shown by FIGS. 12 and 13, head 81 and nut 78 are tightened so as to frictionally engage and compress opposite outer surfaces of walls 180 about apertures 192. As a result, head 81 and nut 78 inhibit or prevent separation of retainer 32 and nut 78, head 81 and shaft 74, maintaining retainer 32 in place about shaft 74 as well as about portions 68, 70. When retainer 32 extends about portions 68, 70, portions 68 may not substantially pivot about axis 72 without contacting surface 186 of walls 180.

Although FIGS. 12 and 13 illustrates the slots of apertures 192 extending upwardly when in the locked state shown, in other embodiments, retainer 132 may be flipped when initially positioned upon handle 30 such that the slots of aperture 192 extend or face in a downward direction. In such an embodiment, gravity assists in retaining retainer 132 in position upon shaft 74 in the locked state. In such embodiments, reliance upon the friction between head 81, nut 78 and the outer sides of retainer 132 to hold retainer 132 in the locked position is reduced or completely alleviated. Rather than being slid in a downward direction to move retainer 132 to an unlocked state or position, retainer 132 would be lifted or slid upwardly to move retainer 132 to an unlocked state.

FIG. 14 illustrates handle 30 in a folded or least partially folded state. FIG. 14 illustrates head 81 and nut 78, sufficiently loosened or spaced apart, to allow retainer 132 to be moved along shaft 74 away from portions 68, 70 such retainer 132 is retracted or withdrawn from across the seam or juncture 96 between portions 68 and 70. FIG. 14 further illustrates an upper handle 30, upper beams 62 and their lower end portions 68, pivoted about axis 72 to a collapsed or folded state. When retainer 32 is in this unlocked state or position, handle 30 maybe folded for more compact transport and storage.

Note that retainer 132 may be shifted or actuated between its locked state shown in FIGS. 12 and 13 and its unlocked state shown in FIG. 14 without complete removal or separation of retainer 132 from handle 30. Retainer 132 may be shifted or actuated between its locked state showing FIGS. 12 and 13 and its unlocked state shown in FIG. 14 without disconnection of beams 60, 62 or disconnection of shaft 74, head 81 or nut 78 from one another. As a result, switching retainer 132 between the locked and unlocked states may be more easily performed without the risk of retainer 132, shaft 74, head 81 or nut 78 becoming misplaced.

FIG. 15 is a perspective view illustrating retainer 132 employed on another folding appliance comprising a walk behind lawnmower 220. In addition to retainers 132, mower 220 comprises support 224, drive unit 226, working unit 228, and handle 230. Support 224 comprises one or more structures configured to serve as a foundation for supporting the remaining components of the foldable appliance (mower 220).

Drive unit 226 comprises a unit or mechanism configured to provide or supply torque or other motive force to working unit 228. In the example illustrated, drive unit 226 comprises an internal combustion engine operably coupled to working unit 228 and supported by support 224. In other embodiments, drive unit 226 may alternatively comprise electrically powered motor. In the yet other embodiments, drive unit 226 may be omitted, such as where working unit 228 is manually powered.

Working unit 228 comprises one or more mechanisms configured to utilize the received torque or force to transform or work upon the surrounding environment or a medium. In the example illustrated, working unit 228 comprises a transmission (not shown) and cutting blade 250. Cutting blade 250 is suspended below support 224 and is configured to be rotated at a high-speed to cut vegetation.

Handle 230 extends from support 224 and is configured to be manually grasped by a person using appliance 220, allowing the person to reposition and move appliance 220. Handle 230 includes lower beams 260, upper beams of 262 and cross member 264. Lower beams 260 form a lower portion of handle 230 and extend upwardly from support 224 on opposite transverse sides of appliance 220. In the example illustrated, lower beams 260 comprise tubular members. In other embodiments, lower beams 260 may alternatively have other cross-sectional shapes. Lower beams 260 are coupled to upper beams 262.

Upper beams 262 and cross member 264 form an upper portion of handle 230. Upper beams 262 have lower portions 268 that overlap upper portions 270 of lower beams 260. Upper beams 262 are hinged or pivotally coupled to lower beams 260 for pivotal movement about pivot axis 272. In the example illustrated, upper beams 262 are hinged to lower beams 260 about axis 272 by shafts 274 extending along axis 272 through one or more apertures 276 formed in overlapping portions 268, 270 of lower beams 260 and upper beams 262, respectively, and also located across or aligned with axis 272.

In the example illustrated, shafts 74 are provided by elongate bolts having a head 81 at one end and a threaded portion at another end, wherein a threaded nut 78 retains the bolt within and across the one of more apertures 276. In the example illustrated, the nut 78 includes a handle, similar to a thumbscrew, facilitating manual rotation of the shaft without the use of tools. Head 81 and nut 78 may be tightened and loosened with respect to overlapping portions 268, 270 to inhibit pivoting of beams 260, 262 about axis 272 or to allow a person to pivot and fold handle 230 to a folded state, respectively.

In other embodiments, lower beams 260 and upper beams 262 may be hinged to one another in other fashions. For example, in other embodiments, other structures may be utilized to provide shafts 74 and other structures may be used to retain shafts 74 within apertures 192. In another embodiment, shaft 74 may include a transverse opening through which a cotter pin or other retainer may be used to retain shaft 74 through and across apertures 192. In one embodiment, bolt head 281 may alternatively comprise a hexagonal bolt head. In yet another embodiment, any one of a variety of hinges may be utilized.

In the example illustrated, upper beams 262 comprise tubular structures (circular, oval, polygonal or other cross-sectional shapes). Lower portions 268 of upper beams 262 are crimped or collapsed so to have a concave outer side having a cavity for partially receiving portions 270 of lower beams 260. In other embodiments, lower portions 68 of upper beams 262 may alternatively be molded or otherwise formed to have a concave outer side having a cavity for at least partially receiving portions 270 of lower beams 260. In still other embodiments, this relationship may be reversed, wherein portions 270 of lower beams 260 are crimped or collapsed so to have a concave outer side having a cavity for partially receiving portions 268 of upper beams 262. In other embodiments, upper portions 270 of lower beams 260 may alternatively be molded or otherwise formed to have a concave outer side having a cavity for at least partially receiving portions 268 of upper beams 262. Because one of portions 268, 270 or mains largely tubular, the rigidity and strength of handle 30 at the overlap of portions 268, 270 is substantially maintained.

Cross member 264 comprises a member extending between and interconnecting upper beams 262. Cross member 264 cooperates with upper beams 264 to form a U-shaped

handle. In the example illustrated, cross member **264** comprises tubular member integrally formed as part of a single unitary body with both of upper beams **262**. In other embodiments, cross member **264** may comprise separate member fastened, welded or connected to upper beams **262**.

Although handle **230** is illustrated as being substantially an inverted U, in other embodiments, handle **230** may have other configurations wherein handle **230** is configured to be folded from an extended use state (shown in FIG. **1**) to a collapsed or folded state.

As when employed on sprayer **20**, when employed with the mower **220**, retainers **132** inhibit pivoting or folding of the upper portion of handle **230** relative to the lower portion of handle **230**. In particular, retainers **232** inhibit pivoting of upper beams **262** relative to lower beams **260** about pivot axis **272**. Retainers **232** overlap a junction between portions **268** and **270** of beams **260** and **262** to inhibit such pivoting. As a result, even when the fit and frictional hold between overlapping portions **268** and **270** may loosen and lessen over time or as a result of vibrations encountered during the use of lower **20**, upper beams **262** and the upper portion of handle **230** are less likely to accidentally pivot or fold about axis **272**. Retainers **232** inhibit relative movement of beams **260**, **262** such that a user that arrived with a more stable feel as if beams **260** and **262** were single continuous beams rather than foldable beams.

Although the present disclosure has been described with reference to example embodiments, workers skilled in the art will recognize that changes may be made in form and detail without departing from the spirit and scope of the claimed subject matter. For example, although different example embodiments may have been described as including one or more features providing one or more benefits, it is contemplated that the described features may be interchanged with one another or alternatively be combined with one another in the described example embodiments or in other alternative embodiments. Because the technology of the present disclosure is relatively complex, not all changes in the technology are foreseeable. The present disclosure described with reference to the example embodiments and set forth in the following claims is manifestly intended to be as broad as possible. For example, unless specifically otherwise noted, the claims reciting a single particular element also encompass a plurality of such particular elements.

What is claimed is:

**1**. An apparatus comprising:

a support;

a working member;

a drive unit carried by the support and operably coupled to the working member to drive the working member;

a first beam extending from the support;

a second beam partially overlapping the first beam and pivotally connected to the first beam for pivotal movement about a pivot axis;

a first retainer overlapping the first beam and the second beam in a direction parallel to the pivot axis to inhibit pivoting of the second beam relative to the first beam, wherein the retainer has an aperture across the pivot axis; and

a shaft extending along the pivot axis through the first beam, the second beam and the aperture.

**2**. The apparatus of claim **1**, wherein the drive unit comprises an internal combustion engine.

**3**. The apparatus of claim **1** further comprising:

a third beam extending from the support;

a fourth beam partially overlapping the third beam and pivotally connected to the third beam for pivotal movement about the pivot axis; and

a second retainer overlapping the third beam and the fourth beam to inhibit pivoting of the fourth beam relative to the third beam.

**4**. The apparatus of claim **3** further comprising a cross member between the second beam in the fourth beam, the cross member forming a handle.

**5**. The apparatus of claim **4**, wherein the second beam, the fourth beam and the cross member are integrally formed as a single unitary body and collectively are U-shaped.

**6**. The apparatus of claim **1**, wherein the working member comprises a pressure washer pump.

**7**. The apparatus of claim **1**, wherein the first retainer comprises a sleeve comprising a tube completely and continuously extending about the first beam and the second beam while receiving the first beam and the second beam.

**8**. The apparatus of claim **7**, where the sleeve includes the aperture over the pivot axis.

**9**. The apparatus of claim **8**, wherein the aperture comprises an elongate slot extending from an axial end of the sleeve and wherein the elongate slot slidably receives the shaft to allow the tube to be slid along the first beam and the second beam, parallel to the first beam and the second beam, while the tube is receiving the first beam and the second beam and while the shaft extends through the elongate slot, through the first beam and through the second beam.

**10**. The apparatus of claim **1**, wherein the retainer comprises an open sided clip receiving one of the first beam and the second beam and partially receiving the other of the first beam and the second beam.

**11**. The apparatus of claim **10**, wherein the clip has an aperture across the pivot axis.

**12**. The apparatus of claim **1**, wherein the first beam comprises a tube, wherein the second beam comprises a tube, and wherein a portion of the tube of the second beam is collapsed so as to have a C-shaped cross-section overlapping the first beam.

**13**. An apparatus comprising:

a retainer having an aperture configured to receive a bolt pivotably hinging a first beam and a second handle beam of a power appliance along a pivot axis, the retainer configured to receive one of the first beam and the second beam while overlapping the first beam and the second beam in a direction parallel to the pivot axis to inhibit pivoting of the second beam relative to the first beam.

**14**. The apparatus of claim **13**, wherein the retainer comprises a sleeve comprising a tube to completely and continuously extend about the first beam and the second handle beam, the tube having a pair of opposite elongate slots and an inner diameter sized to receive the first beam and the second beam, wherein the pair of opposite elongate slots slidably receive the bolt to allow the tube to be slid along the first beam and the second beam, parallel to the first beam and the second beam, while the tube is receiving the first beam and the second beam and while the bolt extends through the elongate slot, through the first beam and through the second beam.

**15**. The apparatus of claim **13**, wherein the retainer comprises an open sided clip configured to receive one of the first beam and the second beam and partially receive the other of the first beam and the second beam.

**16**. A method comprising:

hinging a first beam and a second beam of a power appliance handle with a shaft extending along a pivot axis through the first beam and the second beam;

retaining the first beam and the second beam against relative pivotal movement with a retainer receiving one of the first beam and the second beam and overlapping the first beam and the second beam in a direction parallel to the pivot axis to inhibit pivoting of the second beam relative to the first beam; and

securing the retainer to the first beam and the second beam by extending the shaft through an aperture in the retainer.

**17**. The apparatus of claim **11**, wherein the second beam has a concave side receiving the first beam and wherein the first beam is sandwiched between the retainer and the second beam in a direction parallel to the pivot axis.

**18**. The apparatus of claim **11**, wherein the retainer comprises:

a central portion having an arcuate surface facing the first beam;

arms extending about and in contact with an exterior of the second beam; and

extensions extending between the central portion and the arms, the extensions outwardly spacing apart the arms by an additional distance corresponding to a thickness of those portions of the second beam that overlap the first beam.

**19**. The apparatus of claim **11**, wherein the clip has a mouth, the mouth having a first portion having a first width and a second portion having a second width greater than the first width.

**20**. The apparatus of claim **11**, wherein the clip has a central portion contacting the first beam and arms contacting oppositely facing side surfaces of the second beam.

**21**. The apparatus of claim **15**, wherein the clip comprises:

a central portion having an arcuate surface facing the first beam;

arms extending about and in contact with an exterior of the second beam; and

extensions extending between the central portion and the arms, the extensions outwardly spacing apart the arms by an additional distance corresponding to a thickness of those portions of the second beam that overlap the first beam.

**22**. The apparatus of claim **15**, wherein the clip has a mouth, the mouth having a first portion having a first width and a second portion having a second width greater than the first width.

**23**. The apparatus of claim **15**, wherein the clip has a central portion configured to contact the first beam and arms configured to contact oppositely facing side surfaces of the second beam.

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